

Best Practices in AC Efficiency Policy: Experiences from Brazil, China and India

05 August 2020



Program

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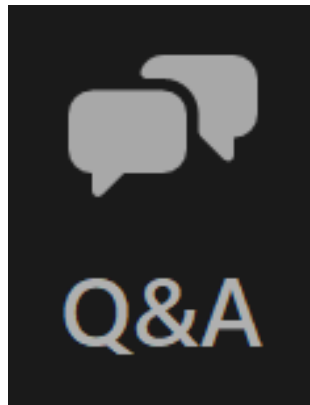
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Logistical Notes

The webinar is being recorded, and you will receive an email with a link to it following the event.

To submit questions during the presentations, use the Q&A button at the bottom of your screen.





Energy Efficiency Policies for Air conditioner

T P Ashwin
Project Engineer(India)
Bureau of Energy Efficiency (BEE)

August 5, 2020



India- NDC and challenges



NDC Targets -India

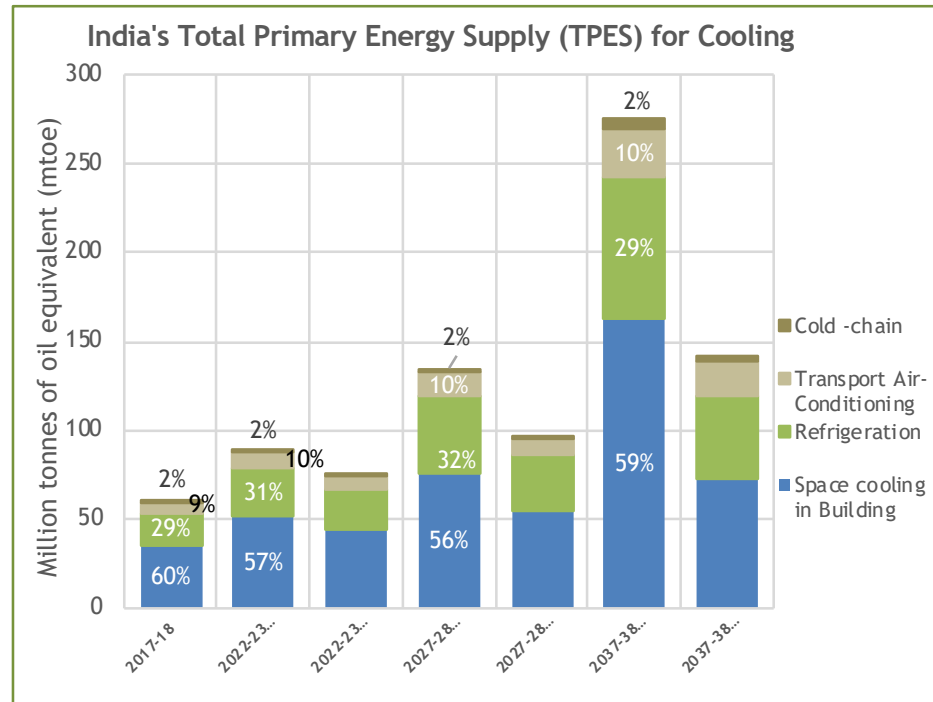
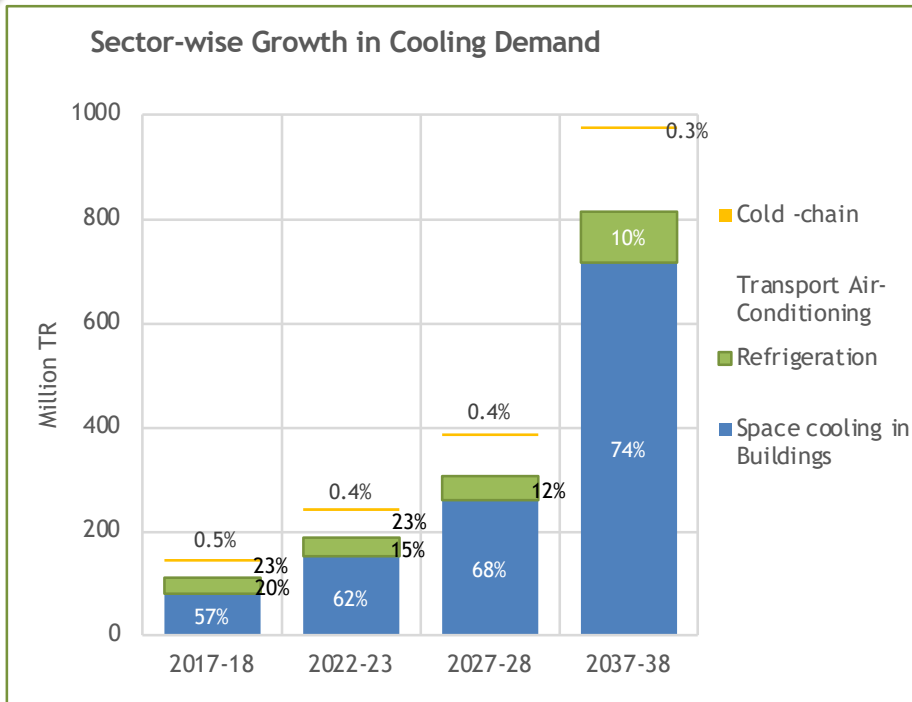
- 1.Reduce the emissions intensity of its GDP by 33 to 35 percent by 2030 from 2005 level.
- 2.Achieve about 40 percent cumulative electric power installed capacity from non-fossil fuel based energy resources by 2030.

Challenges associated- India

1. By 2100, 4.4°C temp rise predicted, Ministry of Earth sciences
- 2.About 173 million people are high risk of lack of cooling access, SEforALL, the chilling report 2020
3. India Ranks 77th at sustainability Index , UN report.
4. India's GDP decreased by 25% in 2019 and may decrease by 96% in 2100 due to climate change, Oxford Economics report 2020



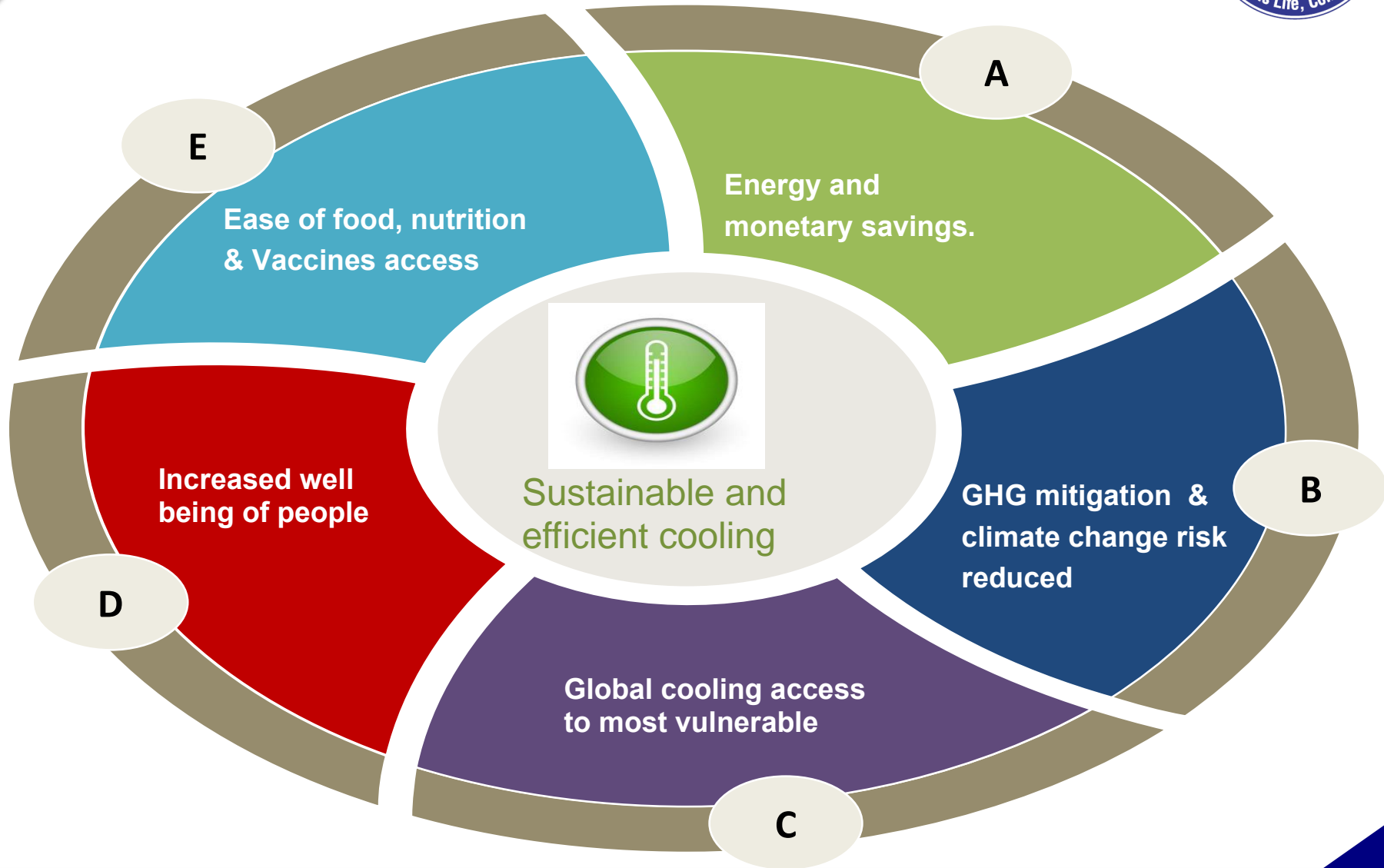
India's Cooling Demand



- ❑ The aggregated nationwide Cooling Demand in TR is projected to grow around 8 times by 2037-38 as compared to the 2017-18 baseline.
- ❑ The TPES requirement for cooling is expected to grow nearly 4.5 times in 2037-38 Reference Scenario, over the 2017-18 baseline .
- ❑ Through policy steps as per ICAP, 25-40% cooling energy reduction may be realized

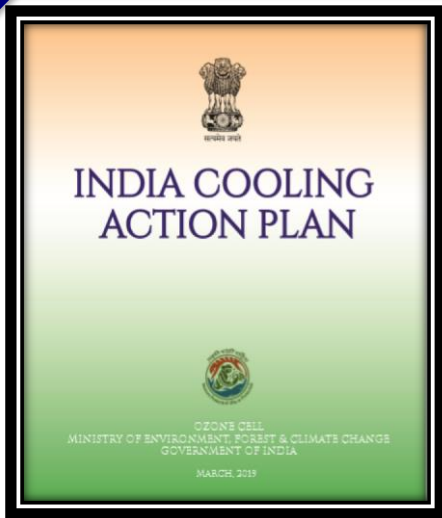


Socio-economic Benefits of Efficient Cooling





Policy Actions of BEE in Efficient cooling



AC

Refrigerator

Ceiling Fan

Chillers

Deep Freezer Light Commercial AC



Default setting of 24 degree celsius is mandated in all BEE approved ACs

Bureau of Energy Efficiency, Ministry of Power, Government of India



Development of Room AC Labeling Program



2006

Launched voluntary policy Room AC (fixed speed)



2011

Launched voluntary policy of Cassette and Floor mounted AC (fixed speed)

2015

Launched voluntary policy of Inverter RAC

2021

Upgradation of 1 star in Energy Performance level



2009

Mandatory of Fixed speed -Room AC policy



2012 - 2014

Biennial upgradation of 1 star in Energy performance level

2018

Common rating plan based on ISEER for fixed speed & Inverter AC (mandatory Inverter AC policy)



Efficiency Improvement for RACs



Revision in Star Rating Plan for Split type RAC (fixed and inverter)

Star level	Jan 2009- Dec 2011	Jan 2012- Dec 2013	Jan 2014-Dec 2017	Jan 2018- Jun 2021	July 2021-Dec 2023
1 star	2.3	2.5	2.7	3.1	3.3
2 star	2.5	2.7	2.9	3.3	3.5
3 star	2.7	2.9	3.1	3.5	3.8
4 star	2.9	3.1	3.3	4.0	4.4
5 star	3.1	3.3	3.5	4.5	5.0

Revision in Star Rating Plan for Unitary type RAC (fixed and inverter)

Star level	Jan 2009- Dec 2013	Jan 2014- Jun2020	July 2021-Dec 2023
1 star	2.3	2.5	2.7
2 star	2.5	2.7	2.9
3 star	2.7	2.9	3.1
4 star	2.9	3.1	3.3
5 star	3.1	3.3	3.5

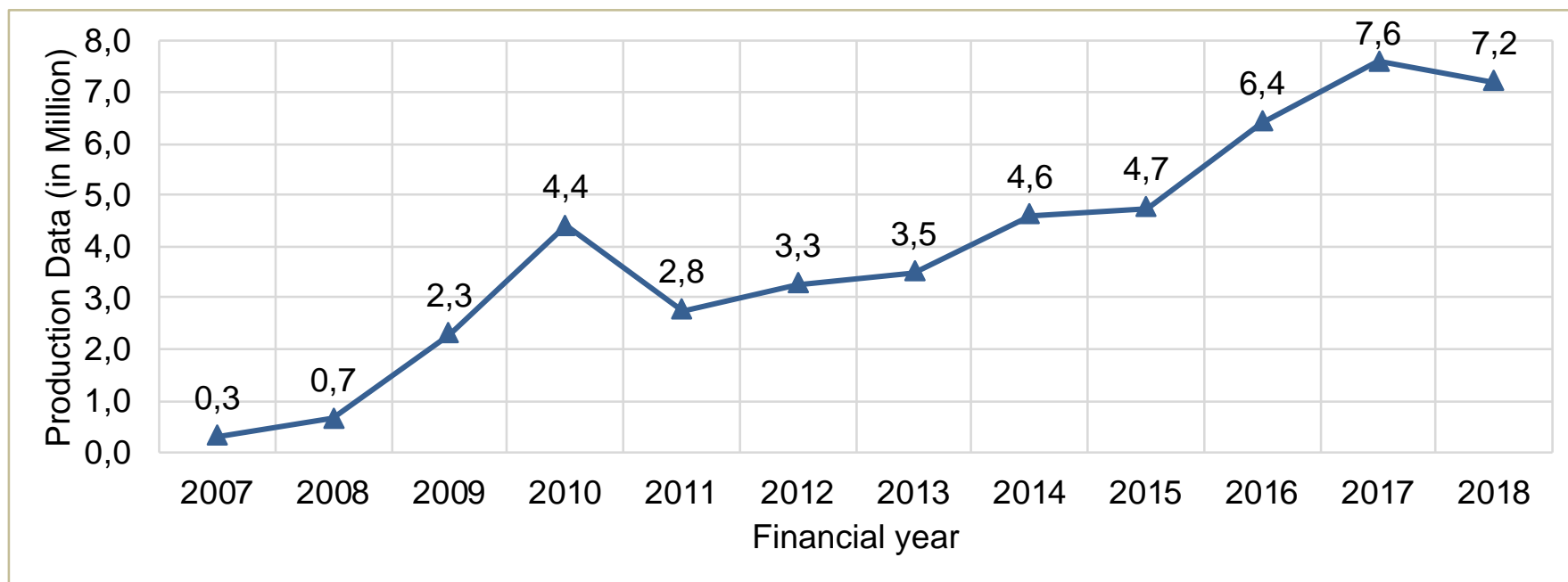
- ❑ Periodically, BEE revised the star rating plans RACs to make the energy performance thresholds more stringent



Inception of ISEER methodology



India RAC Market Growth 2007-2018



- ISO 16358 published in 2013 and discussions started
- BEE recognized exponential growth in the inverter AC market and prepared the regulatory framework for EE.
- BEE recognized the massive energy saving potential



Assessing Inverter AC Market & climatic conditions



- Studied inverter market size and supply chain
- Identified ISO 16358 as a suitable standard
- Examined weather profiles of 57 Indian cities spread across 5 climatic zones
- AC usage hours across the country studied
- Formulated Temperature bins ranging from 24C to 43C, with annual usage hours of 1600
- Developed ISEER calculator to determine ISEER from test results.

Temperature in °C	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	Total
Average Annual Hours	527	590	639	660	603	543	451	377	309	240	196	165	130	101	79	59	44	31	20	10	5774
Fraction	9.1	10.2	11.1	11.4	10.4	9.4	7.8	6.5	5.4	4.2	3.4	2.9	2.3	1.7	1.4	1.0	0.8	0.5	0.3	0.2	100
Bin Hours	146	163	177	183	167	150	125	104	86	67	54	46	36	28	22	16	12	9	6	3	1600



Developing the Energy performance tiers



- Tested 4 samples each from 4 manufacturers in 3 test labs
- Required cooperation from manufacturers for compressor frequency settings
- ISEER calculated from freely available ISEER tool
- Used test results to develop label tiers in consultation with stakeholders
- ISEER methodology launched in 2015

POWER SAVINGS GUIDE

ENERGY EFFICIENCY
ISEER - 4.2*

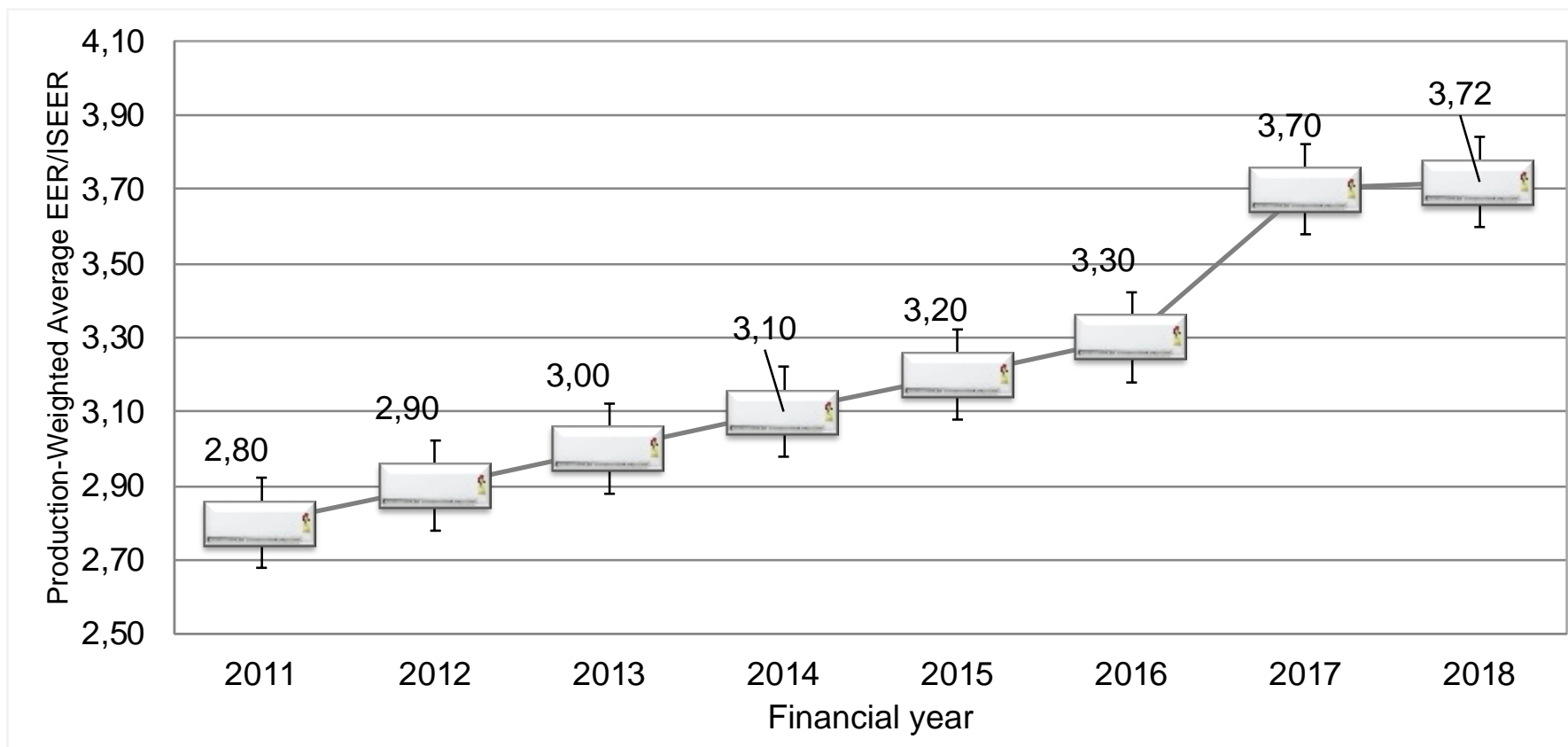
Label Period: 29th June 2015 - 31st Dec 2019

Appliance/Type	: RAC/XXX
Brand	: XXX
Model/Year	: ABC/YYYY
Cooling Capacity (100%)	: XXXX (W)
Cooling Capacity (50%)	: XXXX (W)
Electricity Consumption	: YY Units Per Year
Variable Speed Compressor	: Yes/No
Heat Pump	: Yes/No

*Under test conditions, when tested in accordance with ISO 16358 & based on 1800 operating hours per annum. Actual electricity consumption will depend on how the appliance being used.



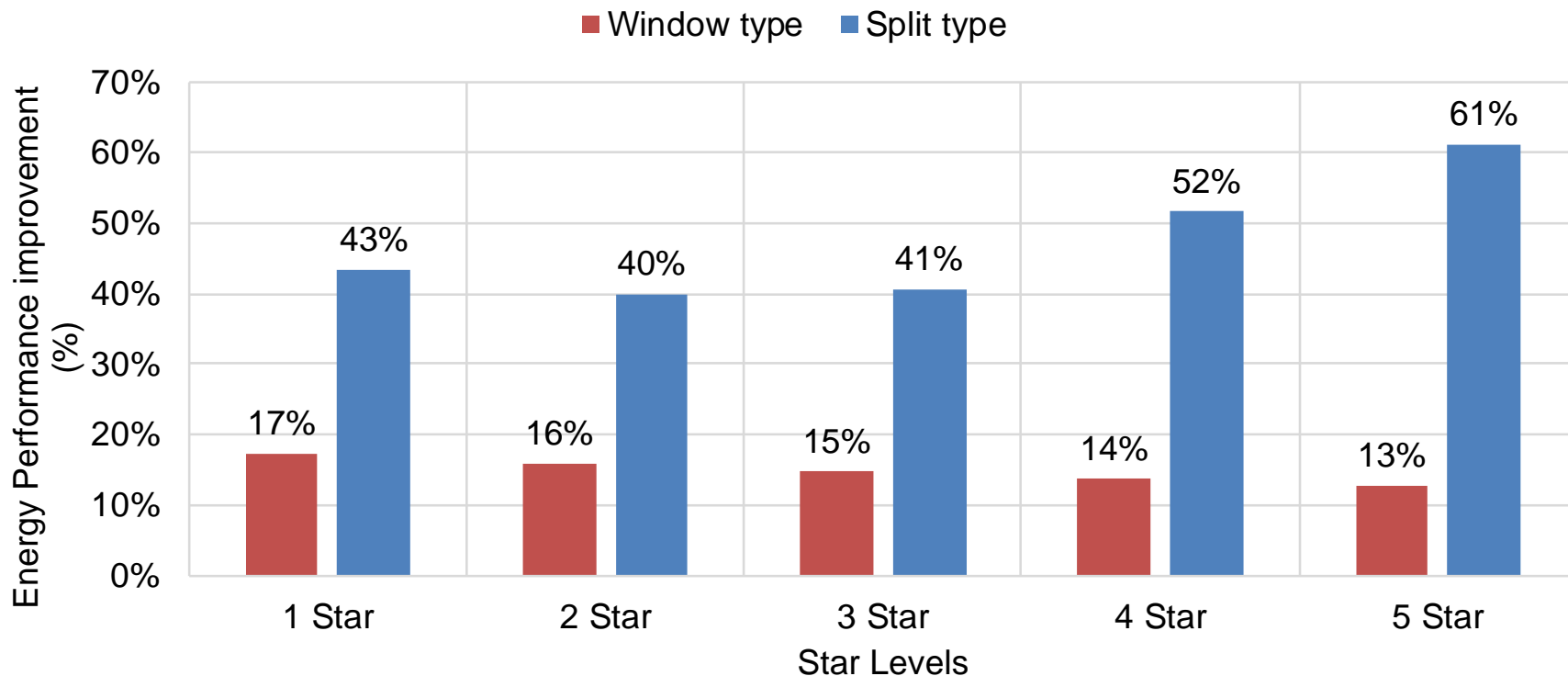
Policy impact of Inverter AC labeling



□ In last three years, the production weighted average EER/ISEER has been increased to 16%, i.e., from 3.2 to 3.72 due to Inverter AC policy



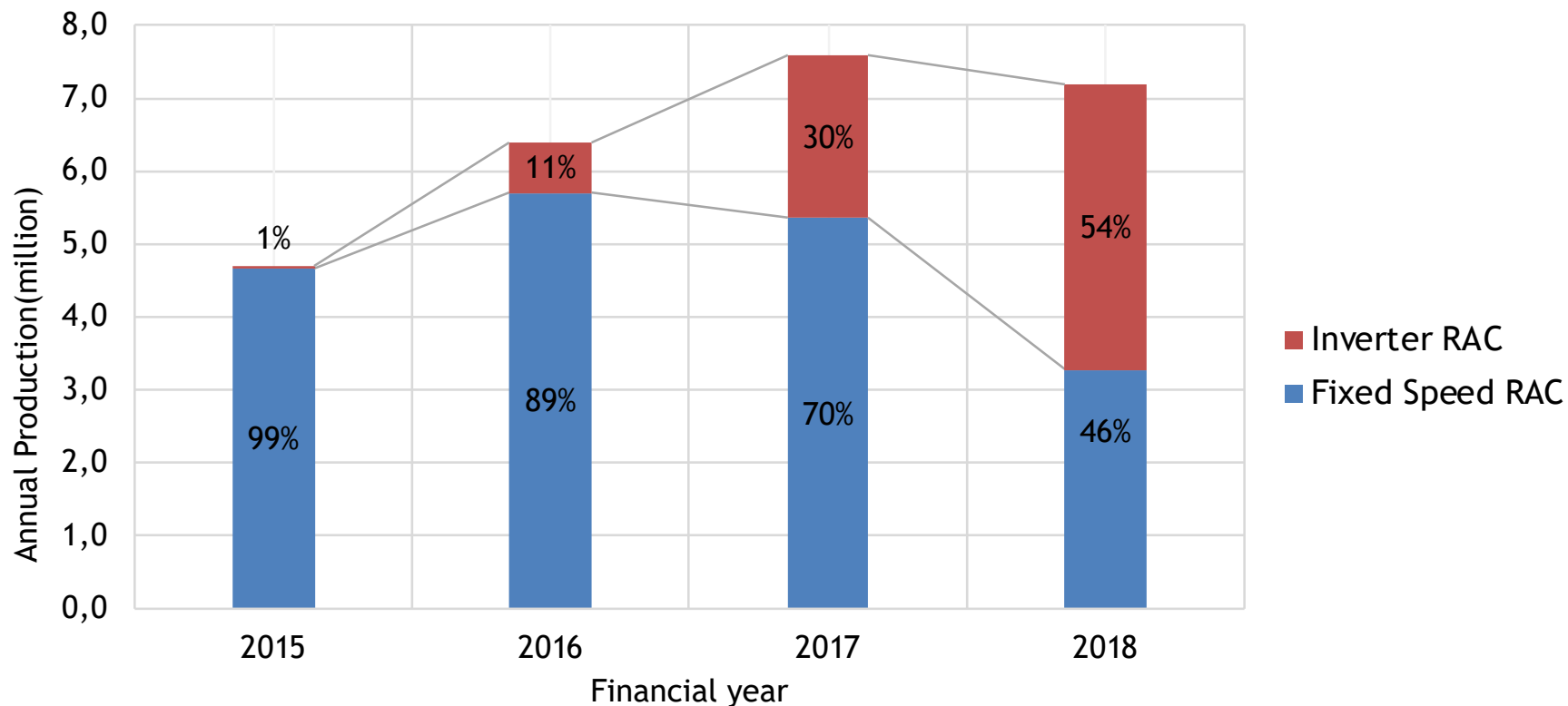
Efficiency Improvement for RACs



- Since inception of program, efficiency of Split AC of 1 Star has been improved by 43% and 5 Star by 61%
- **Policy Impact-** Cumulative 74 Billion Units (BU) of electricity savings and Cumulative 60 Million ton of avoided CO₂ emissions by 2018.



Market Transformation of Room AC



- RAC market reached 7.2 million units by 2018-19, and share of variable speed RACs increased to 54% in 2018



Key Takeaways



- ISEER is a single energy performance index which takes into account different climatic conditions and AC usage hours of India
- ISEER methodology lead to technology agnostic program for Fixed and Variable speed ACs
- ISEER pushed the market towards more efficient variable speed technology and the market share of Inverter AC increased from 4% in 2015 to 54% in 2018.
- Ease of benchmarking with other labeling program of other countries, with suitable correction factor.



THANK YOU

For more info, kindly visit

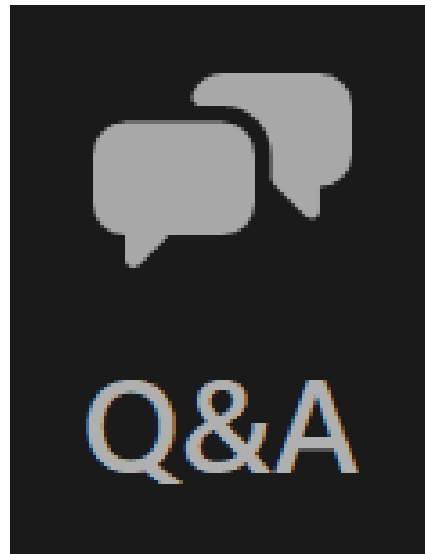
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Discussion

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Energy Efficiency Brazilian Public Policies and Programs for Air Conditioners



Carlos Alexandre Príncipe Pires

Director

Department of Energy Development

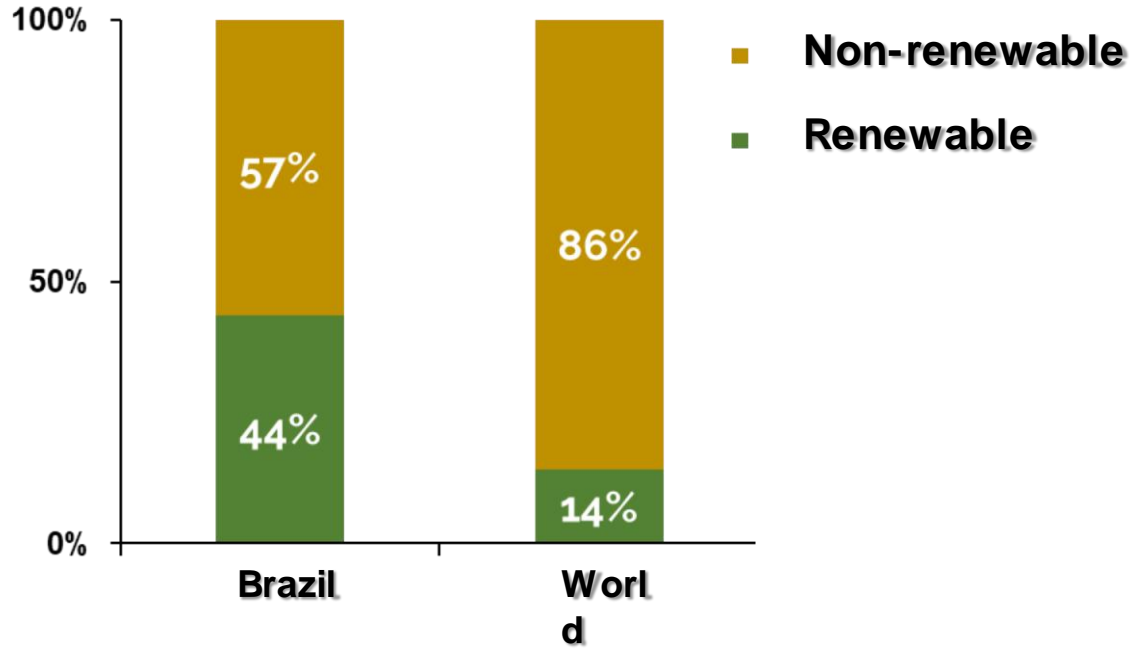
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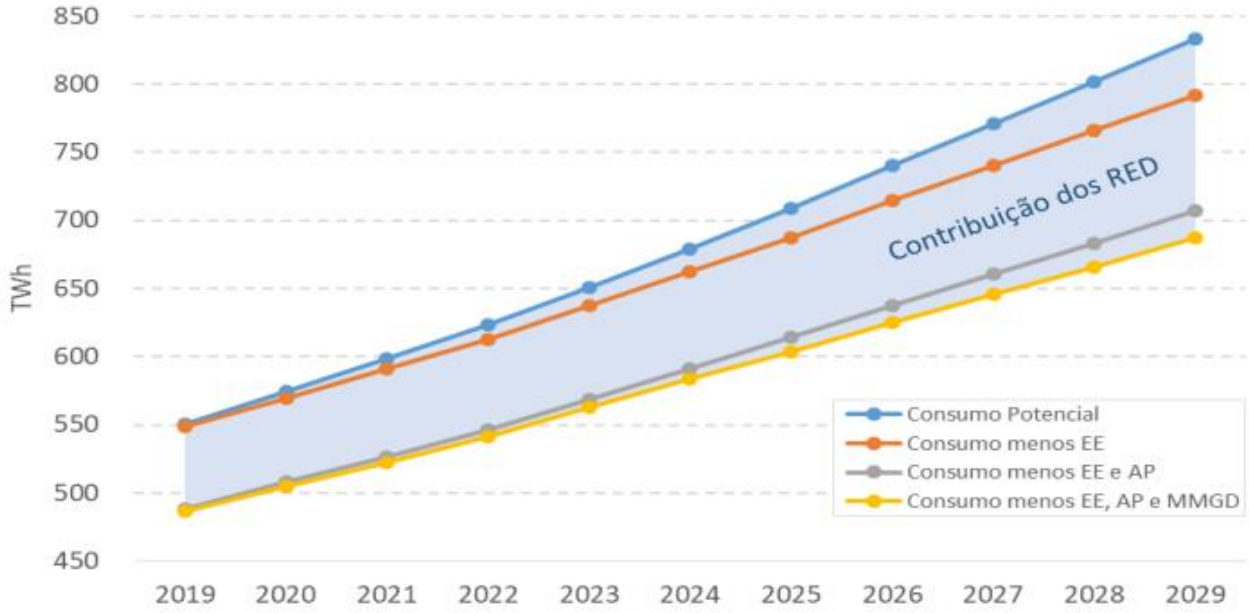
Characteristics of the Brazilian Energy Matrix

- ✓ Brazil has one of the **cleanest energy matrixes in the world**
- ✓ In **2029**, the renewable portion of the energy supply will be at **48%**



PDE 2029: Distributed Energy Resources

✓ The efficiency gains in electricity consumption will reach 40 TWh in 2029, and those related to micro and mini-distributed generation will reach 20 TWh, 40% of the contribution of distributed energy resources (RED) to meeting potential demand in 2029



40 TWh	RED: 145 TWh	17% do consumo potencial de energia elétrica em 2029
85 TWh		
20 TWh		
EE: 40 TWh	AP: 85 TWh	MMGD: 20 TWh
4,8 % do consumo potencial em 2029	10,3 % do consumo potencial em 2029	2,4% do consumo potencial em 2029

Fonte: PDE 2029.



Energy Efficiency

Energy Efficiency – Main Initiatives in Brazil

Brazilian Labeling Program PBE



PROGRAMA
BRASILEIRO DE
ETIQUETAGEM

National Program for Conservation of Oil and Derivatives - CONPET



National Plan for Energy Efficiency Guidelines for an Energy Efficiency Action Plan

Law 10,295



PNEF



Law 13,280



1984

1985

1991

2000

2001

2011

2016

National Program of Electricity Conservation - PROCEL

- Buildings
- Industry
- Public / Street Lighting
- Sanitation
- Education
- Structuring Studies
- Information
- PROCEL Seal
- Municipal Energy Management
- Marketing

Energy Efficiency Program of Electricity Distribution Companies

Regulated by Electricity National Regulatory Agency – defines that 0.5% of the net operating revenue of the companies must be invested in energy efficiency measures

Energy Efficiency Law

National Policy for Conservation and Rational Use of Energy – defines the establishment of minimum energy performance standards for machinery and equipment manufactured and/or sold in the country.

Setting new source of funding and new governance for Procel

Definition of elaboration of a Annual Resource Application Plan (PAR)

Energy Efficiency – Law 10,295/2001

➤ Law 10,295, October 17th, 2001

- Establishes the National Policy of Conservation and Rational Use of Energy, assigning to the Executive Power the establishment of "maximum levels of specific energy consumption, or minimum energy efficiency, of machines and appliances manufactured or sold in the Country."



➤ Decree 4,059, December 19th, 2001 – First regulation

➤ Decree 9,864, June 29th, 2019 – Revision

- Establishment of the **Steering Committee on Energy Efficiency Indicators and Levels – CGIEE**
- Minimum energy efficiency levels should be set according to specific regulations
- Establishment of a Technical Group to discuss procedures for the assessment of the energy efficiency of buildings constructed or retrofitted in Brazil

The process is based on **specific methodologies and regulations, impact assessment and prioritization, conformity assessment criteria, and has accredited laboratories for tests and trials**

Obligation to **hold public hearings** to approve specific regulations

Energy Efficiency – CGIEE Regulated Equipment



Three Phase Induction Electric Motors

Decree nº 4,508/2002 (Specific Regulation)

PI nº 553/2005

PI nº 01/2017



Compact Fluorescent Lamps

PI nº 132/2006 (Specific Regulation)

PI nº 1008/2010



Refrigerators and Freezers

PI nº 362/2007

PI nº 326/2011

PI nº 01/2018



Gas Stoves and Ovens

PI nº 363/2007

PI nº 325/2011



Air Conditioners

PI nº 364/2007

PI nº 323/2011

PI nº 02/2018



Gas Water Heaters

PI nº 298/2008

PI nº 324/2011



Electromagnetic Reactors for Sodium and Metal Steam Lamps

PI nº 959/2010



Incandescent Light Bulbs

PI nº 1007/2010



Distribution Transformers

PI nº 104/2013

PI nº 03/2018



Ceiling Fans

PI nº 02/2017

Air Conditioners – MEPS in force

- MEPS (W/W) for window-type air conditioners, according to the cooling capacity (CR)

	Capacidade de Refrigeração - CR			
	Categoria 1	Categoria 2	Categoria 3	Categoria 4
kJ/h	CR ≤ 9.495	9.496 ≤ CR ≤ 14.769	14.770 ≤ CR ≤ 21.099	CR ≥ 21.100
Btu/h	CR ≤ 9.000	9.001 ≤ CR ≤ 13.999	14.000 ≤ CR ≤ 19.999	CR ≥ 20.000
W/W	≥ 2,84	≥ 2,94	≥ 2,71	≥ 2,65

- MEPS (W/W) for Split air conditioners

W/W	3,02
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CSPF = 3,14 W/W

Air Conditioners – Labelling

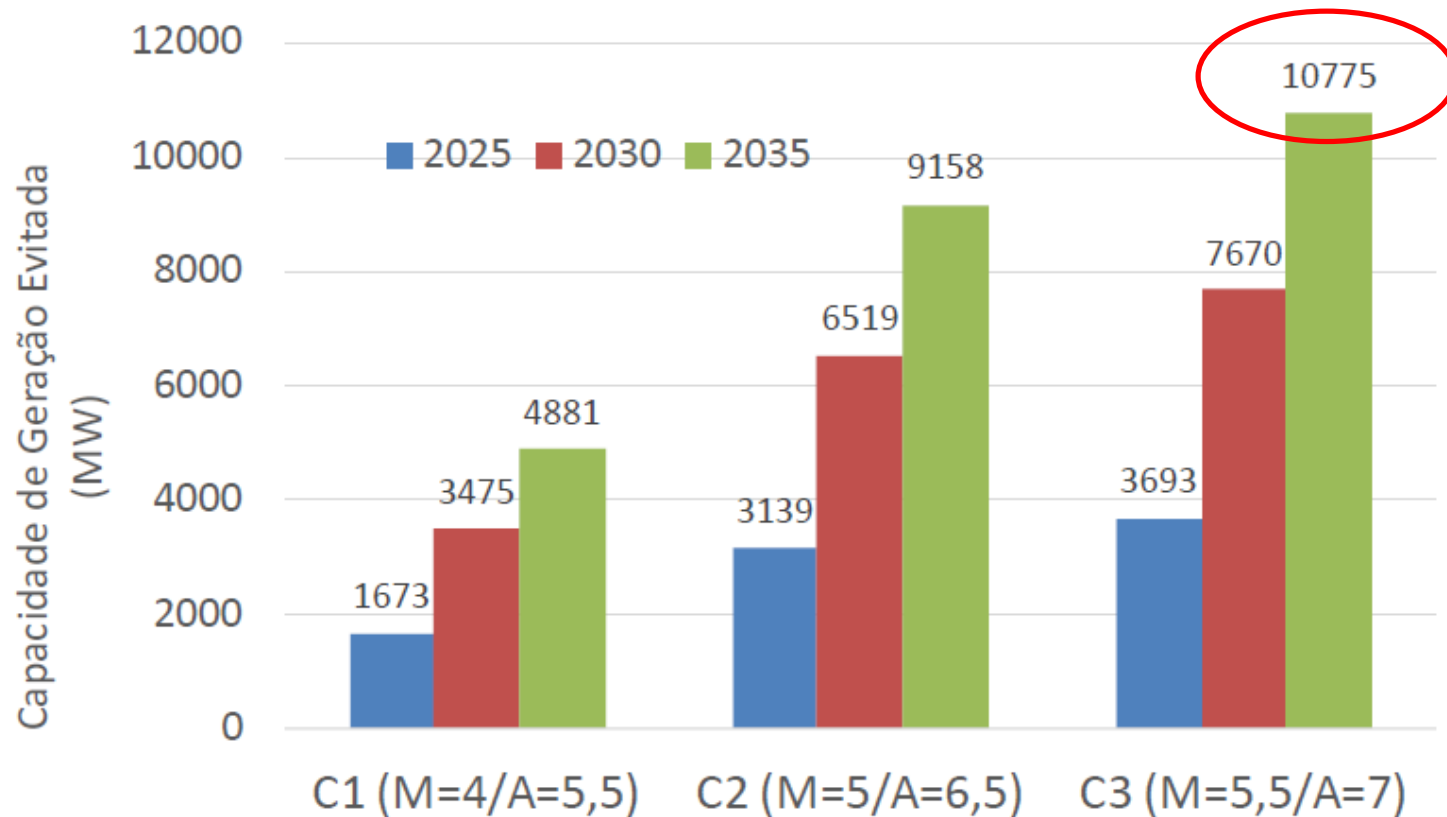
- Regulation Inmetro nº 234, June 29th, 2020:
 - New testing method: according to ISO 16358-1:2013
 - New levels of energy classification

Window-type Air Conditioners (mandatory from January 1st, 2023)				
Classes	Cooling Seasonal Performance Factor - CSPF (Wh/Wh)			
	Category 1	Category 2	Category 3	Category 4
	(<= 9,000 Btu/h)	(9,0001 to 13,999 Btu/h)	(14,000 to 19,999 Btu/h)	(>= 20,000)
	(<= 2,637 W)	(2,638 to 4,102 W)	(4,103 to 5,859 w)	(>= 5,860 W)
A	>= 3.10	>= 3.21	>= 2.95	>= 2.89
B	>= 3.01	>= 3.12	>= 2.87	>= 2.81
C	>= 2.93	>= 3.03	>= 2.79	>= 2.72
D	>= 2.84	>= 2.94	>= 2.71	>= 2.65

Split Air Conditioners (mandatory from January 1st, 2023)	
Classes	Cooling Seasonal Performance Factor - CSPF (Wh/Wh)
A	>= 5.50
B	>= 5.00
C	>= 4.50
D	>= 4.00
E	>= 3.50
F	>= 3.14

Split Air Conditioners (mandatory from January 1st, 2026)	
Classes	Cooling Seasonal Performance Factor - CSPF (Wh/Wh)
A	>= 7.00
B	>= 6.00
C	>= 5.30
D	>= 4.60
E	>= 3.90
F	>= 3.50

Air Conditioners – Impacts (2035)



- 10 GW of avoided generation capacity in 2035
- 30% of NDC for the electricity sector (Paris Agreement)
- 38 TWh of energy saved in 2035 (cumulative)

National Program for Electricity Conservation – Procel

Results 2018

4.9% total electricity consumption in Brazil

Equivalent

Annual consumption of 12 million households

Equivalent

22 billion kWh saved

Equivalent

Power plant of 7,257 MW

Equivalent

Postponed investments of USD **1.3 billion**



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- Buildings
- Municipal Energy Management
- Public Lighting
- Sanitation
- Education
- Industries
- Structuring Studies
- Information Dissemination
- Procel Seal
- Marketing



www.procelinfo.com.br

Procel Seal – Endorsement Label



- Manufacturers = 17;
- Models > 750;
- COP \geq 3,24 for Split;
- Additional performance test is required.



Split Hi-Wall

Split Floor-Ceiling

Split Cassette -Window

- **Review of Procel Seal criteria:** study contracted under the 3rd Procel Resources Allocation Plan
- Mix of strategies → Endorsement Label + Top Runner (Japan)

Effective Approaches

➤ Energy Efficiency for Buildings

- Improved assessment methodology for building labeling - different methodologies for public / commercial and for residential buildings (process of implementation ongoing in Inmetro)
- Studies for a mandatory labeling program for buildings
- Partnership with IEA for improvement of technical standards of energy performance of buildings

➤ Dissemination of ISO 50.001

- Several different activities to disseminate knowledge on Energy Management Systems in different sectors (e.g., industry, public institutions, etc.)
 - Implementation in selected industries / institutions (ICA/Procobre and Senai)
 - International cooperation to internalize methodologies
 - Implementation in the MME headquarters building

➤ Aliança Program (big consumers) and Brasil Mais Produtivo Program (More Productive Brazil) (small and medium consumers)

- Programs supported by Procel for Energy Efficiency measures in the industrial sector

➤ Repaired Electric Motors

- Characterization of the market and dissemination of best practices among users and service providers

Energy Efficiency – Strategy to advance

➤ Revitalization of PROCEL (2016)

- Definition of resources source;
- Prioritization of structuring measures and studies, to support the implementation of public policies

➤ Improvement of monitoring of the results obtained with energy efficiency actions in the country and reinforcement of structural actions (2019/2020):

- Update and improvement of the EPE database and harmonization of indicators in the new EPE report on EE indicators with a chapter in partnership with the IEA presenting an international benchmarking for the industrial sector;
- Improvement of specific regulations for energy-using machines and equipment (air conditioners, refrigerators)

➤ Ten-year Plan for Energy Efficiency (PDEf) and Modernization of the Electricity Sector (2021)

- Identification of energy efficiency potentials in various sectors of the economy
- Definition of the main actions to be taken in each sector to enable potential energy savings
- Follow-up of the Energy Efficiency Auction pilot project, under development by ANEEL



Thank you!



Ministry of Mines and Energy
Secretariat for Energy Planning and Development
Energy Development Division

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Webinar on Best Practices in
Air Conditioner Policy:
Experiences from Brazil,
China, and India.



Advances in the Brazilian Labeling Program for Air Conditioners

Danielle Assafin Vieira Souza Silva
Analyst of Metrology and Quality

05-08-2020

Overview



Inmetro is the executive body of Sinmetro, which is the Brazilian National Metrology, Standardization, and Industrial Quality System.

Inmetro is the federal agency responsible for the Brazilian Labeling Program (PBE).



PBE exists since 1984, and became one of the most important strategies to implement the 2001 Energy Efficiency Law in Brazil.

The labeling for air conditioners started in 2006 and, since then, four revisions to the energy efficiency classification criteria have been carried out. The latest review was one of the most groundbreaking.



A 2015 study conducted by Inmetro found that 91.0% of the consumers recognized the comparative label (ENCE), 79.9% said that they understood the label, and 68.3% said that they would pay 10% more for the highest efficient products.

Main issues in the PBE for air conditioners (AC)

Since 2018, there were just A and B as energy efficiency categories due to the higher MEPS.

77% of the products in the market were in A class.

In the A class, the difference between the lowest and the highest energy consumption achieved 60%.

It was not possible to distinguish the inverter AC's gains in energy consumption because all the products were tested by the full load method.

As a result, AC labeling lost its effectiveness. Consumers could no longer distinguish between higher and lower efficiencies.

Actually, this means a rebound effect, in which consumers tended to believe that all products in A were equally economical.

The label were losing its strength to induce the industry to supply more efficient products with higher technology.

Challenges

Getting information

Cooperation with CLASP, iCS and Kigali Network was crucial for Inmetro to frame the problem, and learn about international trends and best practices.

Defining test method and its parameters

The National Electric Energy Conservation Program (Procel) has conducted a study on the partial load method and seasonal metrics, which helped Inmetro to select ISO 16358-1 and define the temperature set for the tests.

Besides, this study determined the specific Brazilian Bin Numbers,

based on the 2019

Rescaling the label in CSPF

Inspired by the Indian experience, Inmetro coordinated a task force with the industry.

34 split ACs from **9** different suppliers were tested by the partial load method and had their efficiency measured by CSPF.

Lawrence Berkley National Lab (LBNL) helped Inmetro to treat the data.

We found out that **19%** of the tested split ACs already

reach **CSPF of 5,5**.

Conquering the industry commitment

The industrial commitment was crucial to the success of the improvement process. If, in the beginning, they were resistant to change, in the end, they were collaborating and acting together to obtain better results. Dialogue is the key.

Advances

How was it?

How will it be?

Scope

Window air conditioners and split system type (floor ceiling, cassette, and high wall), with cooling capacity up to 17.58 kW (60,000 BTU/h).

Window air conditioners and split system type (floor ceiling, cassette, and high wall), with cooling capacity up to 17.58 kW (60,000 BTU/h).

Labeling levels
*split units

A	3,23	< EER	
B	3,02	< EER ≤	3,23 ↑ 2018 MEPS
C	2,81	< EER ≤	3,02
D	2,60	< EER ≤	2,81

By 2022:

By 2025:

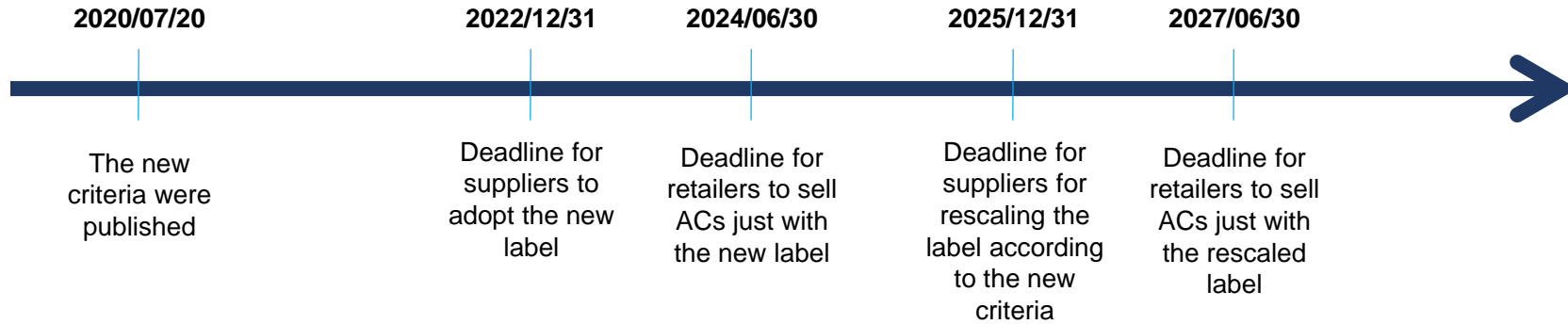
A	5,5 0	≤ CSPF		A	7,0 0	≤ CSPF	
B	5,0 0	≤ CSPF <	5,5 0	B	6,0 0	≤ CSPF <	7,0 0
C	4,5 0	≤ CSPF <	5,0 0	C	5,3 0	≤ CSPF <	6,0 0
D	4,0 0	≤ CSPF <	4,5 0	D	4,6 0	≤ CSPF <	5,3 0
E	3,5 0	≤ CSPF <	4,0 0	E	3,9 0	≤ CSPF <	4,6 0
F	3,1 0	≤ CSPF <	3,5 0	F	3,5 0	≤ CSPF <	3,9 0

Test method

ISO 5151 - Non-ducted air conditioners and heat pumps - Testing and rating for performances.

ISO 5151:2017 - Non-ducted heat pumps - Testing and rating for performances.
ISO 16358-1:2013 - Air-cooled air-to-air heat pumps - Test methods for seasonal performance.
Cooling seasonal performance

Phases of implementation

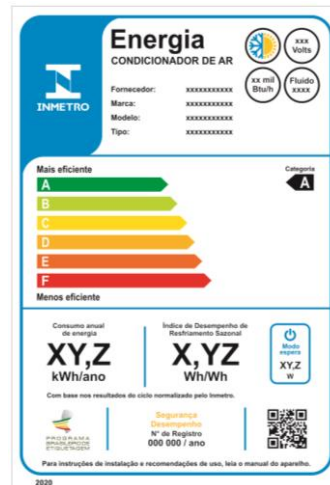


Transition period

It will be possible to find products on the market with the old and the new label.

New label implemented

From now on, there will be just products with the new label on the market.



Higher level criteria implemented



Expected impacts

According to the analysis developed by Kigali Network in Brazil (iCS, IDEC, IEI Brazil), supported by LBNL, the following impacts are expected:

	Impact for consumers	Energy savings	Emissions avoided	Peak demand reduction
A₁: CSPF 5,5	The payback of the investment in the average AC occurs in 4 months.	2023 to 2025: 2,804 GWh	2023 to 2025: 1.3 MT	2025: 407 MW
A₂: CSPF 7,0	The payback of the investment in the average AC occurs in 8 months.	2026 to 2035: 53,807 GWh	2026 to 2035: 25.4 MT	2035: 2,860 MW

The energy saving only in 2035 (9,981 GWh) is equivalent to almost 21% of the projected Brazilian AC consumption.

The emissions avoided only in 2035 (4.7 MT) is equivalent to 22% of the AC projected emissions in 2035.

This is equivalent to avoid 3 thermoelectric plants of Santa Cruz, in Rio de Janeiro!

* The results were presented by Kigali Network to Inmetro during the public consultation in March 2020.

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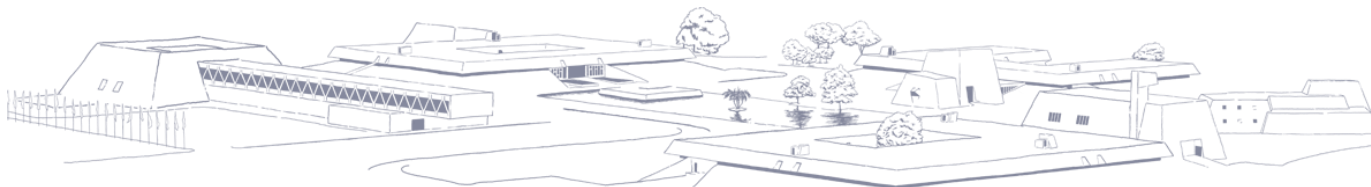
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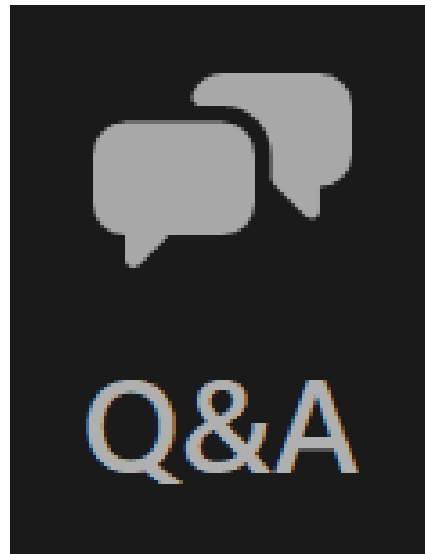


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Discussion

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MEPS and Energy Labeling for Room AC in China



Dr. Meng LIU
China National Institute of Standardization
5 Aug., 2020



1. MEPS and Labeling levels



中国标准化研究院
CHINA NATIONAL INSTITUTE OF STANDARDIZATION

GB 21455-2019 “Minimum allowable values of the energy efficiency and energy efficiency grades for room air conditioners”

Table 1 Indicators of energy efficiency grades for heat-pump type room ACs

Rated cooling capacity (CC) W	Annual performance factor (APF)				
	Energy efficiency grades				
	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
CC ≤ 4 500	5.00	4.50	4.00	3.50	3.30
4 500 < CC ≤ 7 100	4.50	4.00	3.50	3.30	3.20
7 100 < CC ≤ 14 000	4.20	3.70	3.30	3.20	3.10

Table 2 Indicators of EE grades for cooling only type room ACs

Rated cooling capacity (CC) W	Seasonal energy efficiency ratio (SEER)				
	Energy efficiency grades				
	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
CC ≤ 4 500	5.80	5.40	5.00	3.90	3.70
4 500 < CC ≤ 7 100	5.50	5.10	4.40	3.80	3.60
7 100 < CC ≤ 14 000	5.20	4.70	4.00	3.70	3.50

Table 3 Indicators of EE grades for low ambient temp air source heat pump air heaters

Nominal heating capacity (HC) W	Heating seasonal performance factor (HSPF)		
	Energy efficiency grades		
	Grade 1	Grade 2	Grade 3
HC ≤ 4 500	3.40	3.20	3.00
4 500 < HC ≤ 7 100	3.30	3.10	2.90
7 100 < HC ≤ 14 000	3.20	3.00	2.80

1. MEPS and Labeling levels



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Label template



Background: Blue and White

Length: 109 mm , width: 66 mm

Information required for Heat pump ACs :

- (1) Name of Manufacturer ;
- (2) Model ;
- (3) EE grade ;
- (4) Annual performance factor [(W·h)/ (W·h)] ;
- (5) Rated cooling capacity (W) ;
- (6) Rated heating capacity (W) ;
- (7) Cooling seasonal power consumption(kW·h) ;
- (8) Heating seasonal power consumption(kW·h) ;
- (9) No. of EE standard;
- (10) QR code;



1. MEPS and Labeling levels



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Label template



109mm

66mm

Background: Blue and White

Length: 109 mm , width: 66 mm

Information required for cooling ACs :

- (1) Name of Manufacturer ;
- (2) Model ;
- (3) EE grade ;
- (4) Seasonal energy efficiency rating SEER[(W·h)/(W·h)] ;
- (5) Rated cooling capacity (W) ;
- (6) Cooling seasonal power consumption(kW·h) ;
- (7) No. of EE standard;
- (8) QR code;



1. MEPS and Labeling levels



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Label template



Background: Blue and White

Length: 109 mm , width: 66 mm

Information required for Low ambient temperature air source heat pump air heaters :

- (1) Name of Manufacturer ;
- (2) Model ;
- (3) EE grade ;
- (4) Heating seasonal performance factor (HSPF) [(W·h)/(W·h)] ;
- (5) Rated heating capacity (W) ;
- (6) Heating seasonal power consumption(kW·h) ;
- (7) No. of EE standard;
- (8) QR code;



2. Challenges

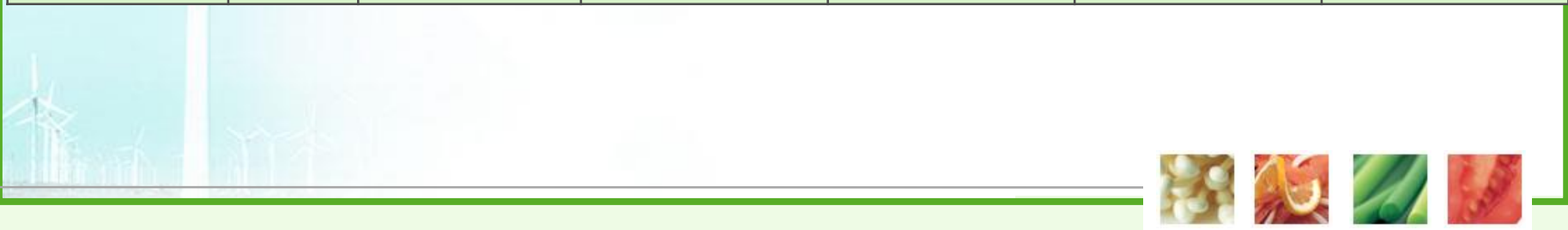


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For fix speed AC, the newly revised MEPS (GB 21455-2019) changes the efficiency metric from EER to APF.

The only way is to test and measure the fix speed AC by following APF methods and then calculate the APF corresponding value to EER value. The problem is that **there are multi corresponding APF values to the one EER value** rather than one to one match. **It should be decided by market survey, further testing and analysis.**

Capacity	Metric	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
CC ≤ 4500	EER	5.6	5.0	4.4	3.8	3.6
	APF	4.48~5.04	4.05~4.53	3.63~4.02	3.21~3.51	3.07~3.34



3. Stakeholders involvement



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Manufacturers were widely involved in the development of MEPS and labeling

- Gree
- Midea
- Haier
- CHANGHONG
- DAIKIN (China)
- HISENSE
- TCL
- Panasonic(Guangzhou)
- MITSUBISHI(Shanghai)
- SANYO(Shenyang)
- AUX
- CHIGO
-



3. Stakeholders involvement



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Besides widely involvement in the development of national MEPS and labeling, *the Enterprise Standards Forerunner Program* has been launched in China and the manufacturers are encouraged to develop their own enterprise standards with higher efficiency requirements for producing ACs more efficient than the national MEPS.

Regular evaluation is conducted to the manufacturers standards and the best standard is selected as the enterprise standards forerunner, in other word, which could be seen as the benchmark of the most energy efficient.



4. Implementation



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- GB 21455-2019 came into effect on **July 1, 2019**.
- Products that have been delivered or imported before the implementation date of this standard may be marketed **before June 30, 2021**.



5. Market impact



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- The energy efficiency of RAC is improved significantly, the less efficient products (fix-speed RACs) are phasing out rapidly.
- The product price goes up at very beginning, but with more products being produced and deployed, the product price will goes down rapidly to the normal price level based on the past 30 years experiences.
- Technology update is being accelerated.



5. Market impact



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Promotion of EE products

- About 80 million ACs are promoted annually
- Measures for promoting EE ACs
 - ✓ Local subsidy program for ACs of grade 1 and 2;
 - ✓ Local shopping allowance distributed through Apps and online retailers websites for boosting consumption during COVID-19.
 - ✓ “Old for new” launched by large online retailers such as JD, Suning, Gome, subsidy are provided for consumers who return old appliances through the designated channels, and the installation fee will be discounted





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Thank you for your attention!!

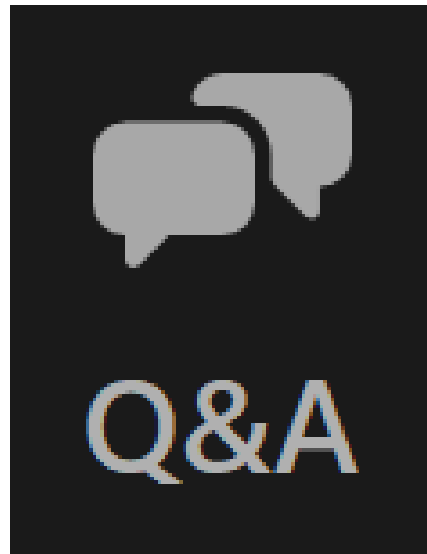
Dr. Meng LIU

China National Institute of Standardization

Email: liumeng@cnis.ac.cn

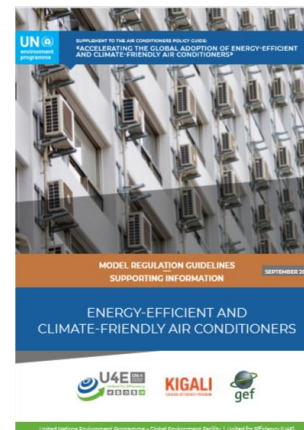
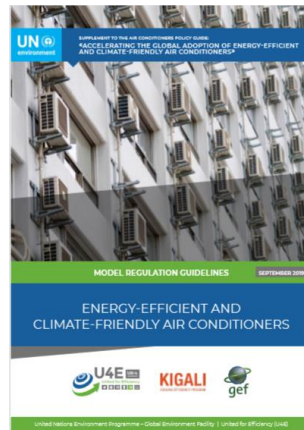
Discussion

Please use the Q&A button at the bottom of your screen to pose questions to the moderator.





Overview of U4E Model Regulation Guidelines for Air Conditioners and Refrigerating Appliances



Brian Holuj, Cooling Lead, UNEP U4E

5 August 2020

60+ Expert Reviewers

FUNDERS



GLOBAL MANUFACTURERS & INDUSTRY ASSOCIATIONS



TECHNICAL ORGANISATIONS & INITIATIVES



REGIONAL INTERGOVERNMENTAL ORGANISATIONS



Scope

Air Conditioners



(non-ducted single split, self-contained, portable and reversible heat pumps)

Refrigerating Appliances

REFRIGERATORS

one or more chilled compartments, generally at various temperature zones between 0°C and 14°C, and which may include an ice-making section



FREEZERS

one or more frozen compartments, usually between -18°C and -6°C



FRIDGE-FREEZERS

combination of both chilled and frozen compartment(s) in the same appliance

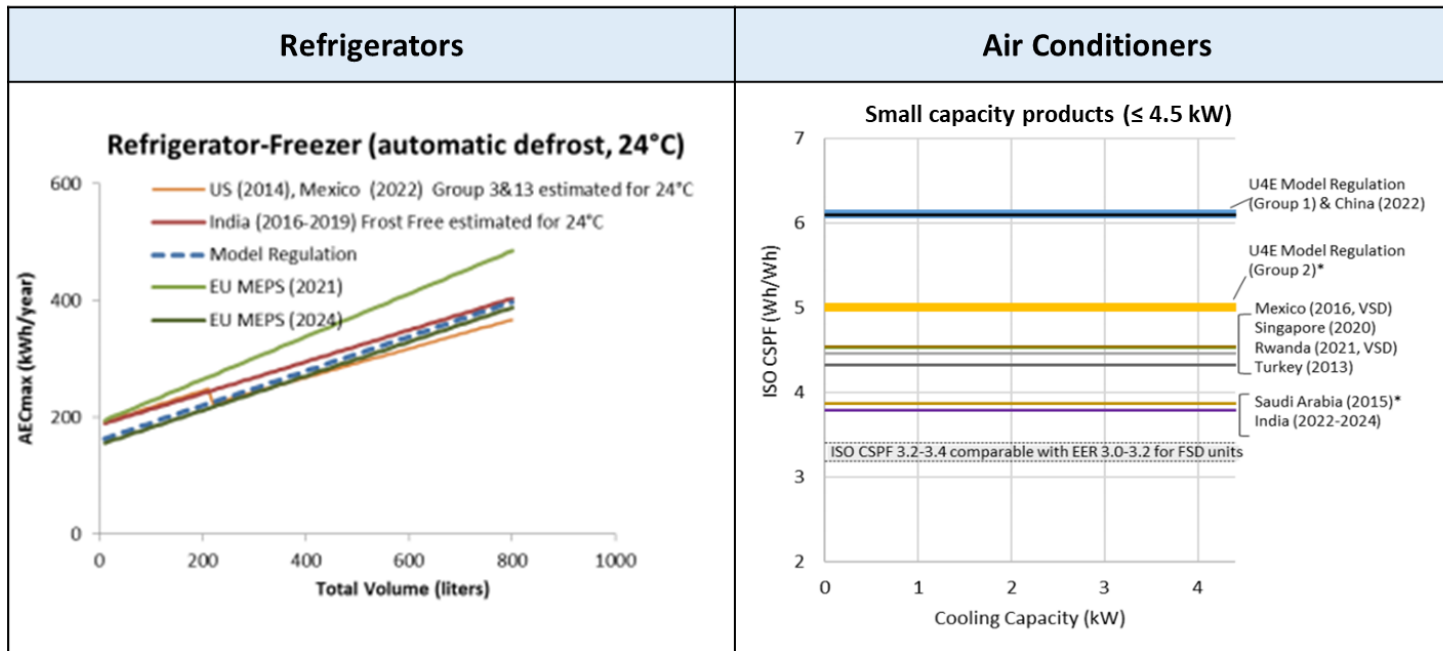


Energy Performance Evaluation Methods

	Refrigerators	Air Conditioners
Category	<ul style="list-style-type: none"> Refrigerators Refrigerator-Freezers Freezers 	<ul style="list-style-type: none"> Air conditioners, Heat pumps (reversible) Fixed-speed, variable-speed
Reference Standards	<ul style="list-style-type: none"> IEC 62552:2015 (Part 1, 2, and 3) 	<ul style="list-style-type: none"> ISO 5151:2017 ISO 16358-1, -2, -3: 2013 ISO 16358-1: 2013/Amd 1: 2019
Key parameters	<ul style="list-style-type: none"> Volume adjusted by compartment Manual/automatic defrost Energy consumption measured at 16°C and 32°C 	<ul style="list-style-type: none"> Performance measured at 35°C (and 46°C for extremely hot-dry regions) Outdoor temperature bin hours by ISO 16358 and climate regions (per ASHRAE definitions)
Efficiency metric	<ul style="list-style-type: none"> Annual Energy Consumption (kWh/year) for 24°C (plus 20°C and 32°C) 	<ul style="list-style-type: none"> Cooling Seasonal Performance Factor (CSPF, Wh/Wh) for cooling-only units Annual Performance Factor (APF, Wh/Wh) for reversible heat pumps

Minimum Energy Performance Requirements

- The Model Regulation Guidelines suggest requirements to be consistent with the market transition expected from technology and policy improvements in major and emerging economies.



See the Model Regulation Guidelines Supporting Information for more details.

Inefficient products can't meet these levels, and there are stretch tiers for labels.

Product Information

- All representations of energy performance shall indicate that the performance rating is based on the measurement according to [test standard name], an indicative value, and not representative of actual annual energy consumption in all situations.

Refrigerators	Air Conditioners
<ol style="list-style-type: none"> 1) Model name / serial number 2) Type of unit [refrigerator, refrigerator-freezer, or freezer] 3) Country where the product was manufactured 4) Volume of the different compartments and an indication of whether they are frost-free 5) Rated performance grade 6) Yearly energy consumption in kWh at ambient temperature in °C or °F 7) Reference ambient temperature[s] used in performance rating 8) Refrigerant and foam-blowing designation in accordance with ISO 817 or ASHRAE 34, including ODP and GWP. 	<ol style="list-style-type: none"> 1) Model name / serial number 2) Type of unit [ductless split, self-contained, or portable] 3) Country where the product was manufactured 4) Rated cooling (and heating, if applicable) capacity in kW 5) Rated maximum power consumption in kW 6) Rated performance grade 7) Rated energy efficiency in [CSPF, APF, EER, or COP], and yearly electricity consumption in kWh 8) Refrigerant designation in accordance with [ISO 817 or ASHRAE 34], including ODP and GWP.

Refrigerant & Foam Blowing Agent Requirements

- Requirements for ozone depletion potential (ODP) and global warming potential (GWP) over a 100-year time horizon.
- Refrigerant designation (ISO 817), Safety requirements (ISO 5149 or IEC 60335-2-40, IEC 60335-2-24).

	Refrigerators	Air Conditioners
GWP	20	<ul style="list-style-type: none">• 750 (Split system)• 150 (Self-contained system)
ODP	0	0

Deployment



Available: English, Spanish, Chinese

Upcoming: French, Arabic, Portuguese

Directly by U4E

• National Projects

- MEPS & Labels: Rwanda, Dom. Rep., Pakistan, Chile
- Financial Mechanisms: Ghana, Senegal, Rwanda, Costa Rica; Sustainable Public Procurement pilots in 2021

• Regional Projects

- MEPS & Labels: East Africa; Southern Africa; ASEAN

• Global

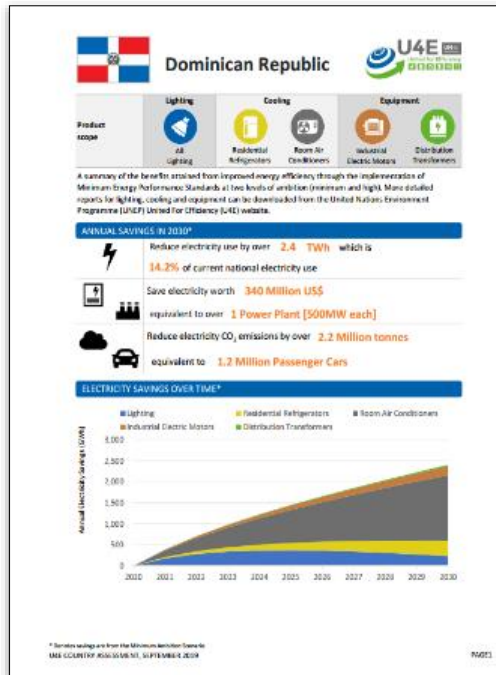
- MOP & COP
- Cool Coalition Working Group on regional policy alignment
- Webinars (English, Chinese, French, Spanish)
- Twinning participants email blast; social media; press releases

By Partners

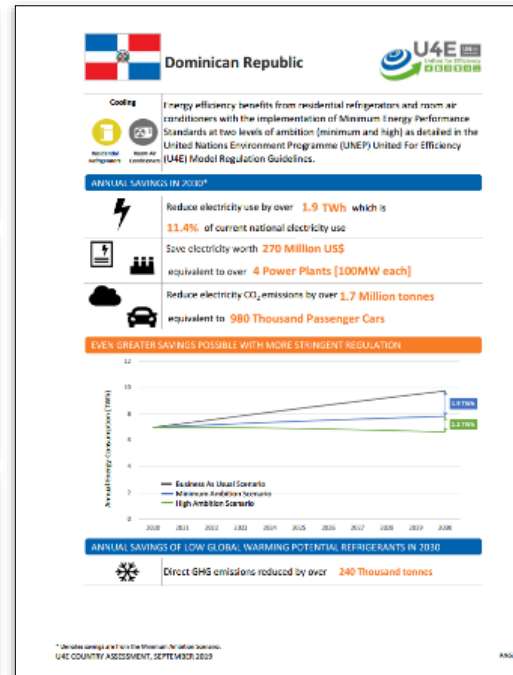
- CLASP, LBNL, NRDC, IIEC, Development Banks, Regional Centres, etc

Country Savings Assessments Available for 155 Countries – Show the Impacts of implementing the U4E Model Regulations

All Products



Cooling



<https://united4efficiency.org/countries/country-assessments>



Contact

TRANSFORMING MARKETS TO ENERGY-EFFICIENT PRODUCTS

<https://united4efficiency.org/resources/model-regulation-guidelines-for-energy-efficient-and-climate-friendly-air-conditioners>

<https://united4efficiency.org/resources/model-regulation-guidelines-for-energy-efficient-and-climate-friendly-refrigerating-appliances>



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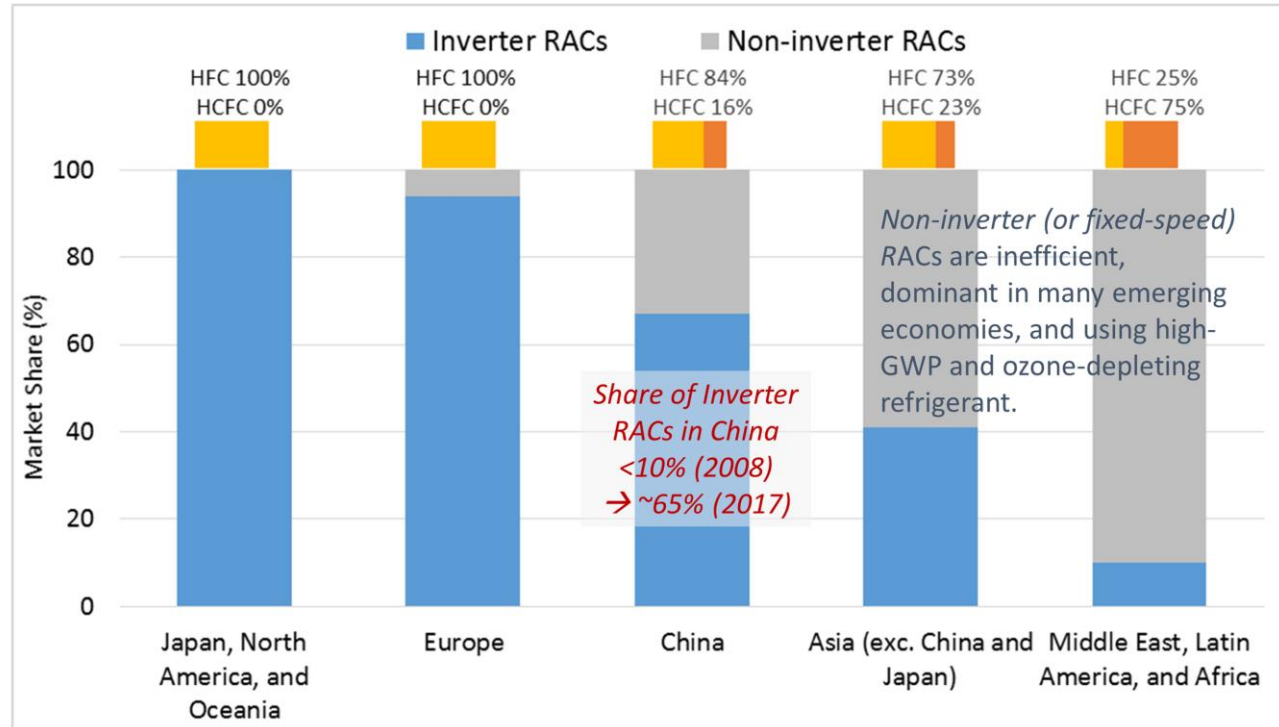
united4efficiency.org

Conclusions and Recommendations

- MEPs and labels should be enhanced to minimize growth in energy use and pollution caused by new A/Cs and refrigerators
- Address the refrigerant and efficiency simultaneously, informed by Model Regulations
- Harmonizing across countries benefits consumers, manufacturers, and governments
- Compliant products are already on the market
- More efficient models are cost-effective for consumers
- Refrigerators are a high impact opportunity to follow the regional path used for lighting and air conditioners

Global Air Conditioner (AC) Market Transition

- The global room AC market is in the midst of transition toward energy-efficient and sustainable technologies.

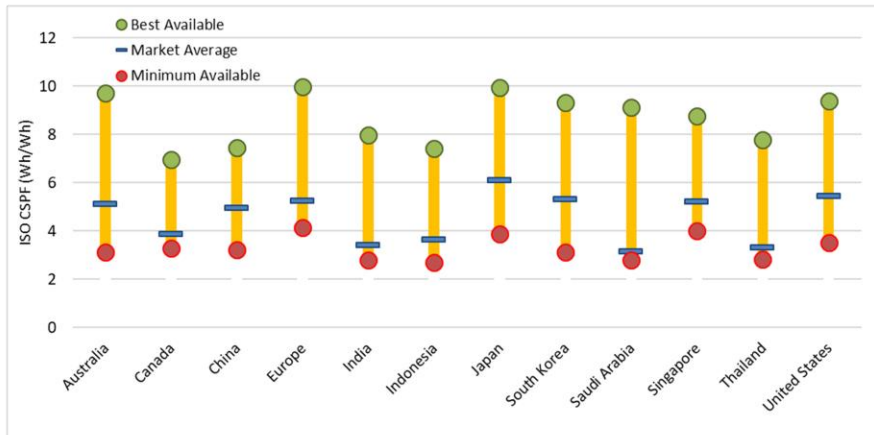


Source: JRAIA and LBNL estimates



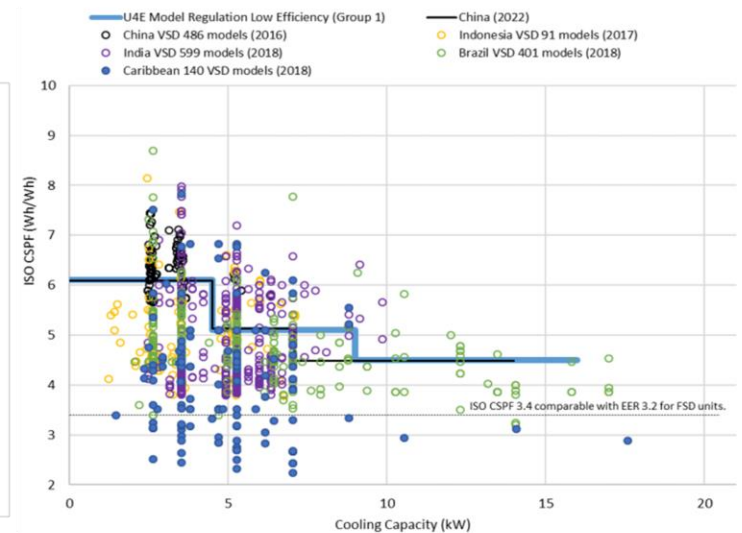
Availability of Compliant Air Conditioners

- There are opportunities to achieve bigger energy savings in commercially available technologies.
- 12–26 percent of variable-speed AC models available (2016-2018) in major emerging economies are estimated to meet the Model Regulation low-efficiency levels.



Source: LBNL's work based on IEA data

Efficiency of available residential ACs in selected regions



Source: AC Model Regulation Guidelines Supporting Information

Efficiency in ISO CSPF estimated for variable-speed ACs available in selected economies



Thank you for participating in this event,

Best Practices in AC Efficiency Policy: Experiences from Brazil, China and India

At the end of this session you will be presented with a link to a brief evaluation survey. We appreciate your responses, which will help us plan future events.

You will receive a follow-up email with a link to a recording of today's session.